



## **NASA STTR 2012 Phase I Solicitation**

### **T11 Modeling, Simulation, Information Technology and Processing**

Modeling, Simulation, Information Technology and Processing consists of four technology subareas, including computing, modeling, simulation, and information processing. NASA's ability to make engineering breakthroughs and scientific discoveries is limited not only by human, robotic, and remotely sensed observation, but also by the ability to transport data and transform the data into scientific and engineering knowledge through sophisticated needs. With data volumes exponentially increasing into the petabyte and exabyte ranges, modeling, simulation, and information technology and processing requirements demand advanced supercomputing capabilities.

## **Subtopics**

### **T11.01 Software Framework & Infrastructure Development of Spaceborne Hybrid Multicore/FPGA Architectures**

**Lead Center:** GSFC

**Participating Center(s):** ARC, JPL, KSC

Future high-performance on board computing systems will likely employ hybrid architectures consisting of both advanced multi-core processors and reconfigurable Field Programmable Gate Arrays (FPGAs), which may include additional embedded hard and/or soft core processors along with processing functions implemented in the FPGA logic. Advanced software architectures, software infrastructure elements and software design tools are needed to compliment these advanced hardware platforms and enable their efficient/effective use. The intent of this subtopic is to develop these software architectures, infrastructure elements and tools.

Desired technologies include multi-core software frameworks, multi-core operating system components, hardware/software abstraction layers & interfaces, and development systems/tools/simulators. Additionally, middleware/hypervisors are needed that can perform memory protection and run-time allocation of tasks to processing resources, and address performance optimization, energy management, and fault mitigation.

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## **T11.02 Distributed Simulation for Design and Manufacturing**

**Lead Center: KSC**

NASA is embarking on missions to new environments with new technologies and new systems to take us far beyond where any human has gone before.

Understanding, managing and leveraging the associated complexity will require new tools, new methods, new ways of managing data and, in the long run, entirely new types of data as well. Simulation plays a key role in each of these areas with advanced tools and processes already in use to define architectures, study options and integrate alternatives into the overarching plan. However, today's tools, and even tomorrow's tools, lack the ability to integrate and share information on the physical and temporal scale necessary to efficiently and effectively enable these systems.

Desired product is a prototype suite of tools, systems and processes to allow researchers, innovators and operational organizations to share simulation based needs, technologies, concepts and opportunities over large distances (planets) and large increments of time (decades). The system should utilize existing Industry and NASA standards and interfaces for simulation data, suggest new ones, or both. Emphasis should be placed on interfaces like XML to both extend the lifecycle of data elements into the 50 year range as well as interface with the emerging set of NASA tools.

Distributed Simulation of this nature has been identified by the National Research Council as one of the 83 high priority technologies for NASA as a part of the OCT roadmap team efforts. It is a part of TA 11 (modeling, simulation, information technology and processing) and is one of the 4 high priority technologies identified for that roadmap. It directly supports any complex design and development efforts directly and supports technology push and pull by better communicating programmatic needs and technology solutions in relevant operational environments.